

**Lesson 3.9 Obj:** To practice exp growth and calculate exponential decay.

**(0-10) Do Now:**

**1. Blast from the Past:**

Write the equation of the line that passes through (-2, 7) that is perpendicular to  $y = -x + 3$ .

**( $y = x + 9$ )**

**2. Simplify:**  $\frac{(-6x^2y^5z^{-8})^2}{(3x^{-3}y^{-5}z^{12})^3}$

**(10-20) HW Check**

**(20-35) Notes: Exponential Decay**

**Formula:**  $y = ab^x$

a = initial amount,

b = decay factor (must be between 0 and 1)

x = # of time periods

**Two Main Types of Exponential Decay:**

1. Half-life: b is ALWAYS  $\frac{1}{2}$

2. Percentage: 100% - Decay Percentage. Then change to a decimal.

**Why? Because we are looking for what REMAINS.**

**Ex 1:** The half-life of carbon-14 is 5,700 years. If there are 400 atoms of carbon in a fossil today, how many atoms will be present in 39,900 years? Be sure to write the general exponential decay formula and show all substitution.  **$y = a(b)^x$   $y = 400(\frac{1}{2})^7 = 3.125 \text{ atoms} \sim 3 \text{ atoms}$**

**Find b by dividing 39,900 by 5,700**

**Ex 2:** The thickness of the ice in Arctic regions is decreasing, causing the population of polar bears to decrease at an annual rate of 4.2%. If there are 22,193 polar bears currently in the wild today, approximately how many polar bears will be in the wild in 2024? Round to the nearest polar bear.

Be sure to write the general exponential decay formula and show all substitution.

**$y = a(b)^x$  Find b:  $100\% - 4.2\% = 95.8\% = 0.958$ ;  $y = 22,193(0.958)^8 = 15,745 \text{ polar bears}$**

**(35-45) Exit Slip**

1. Explain how to find b if given a percentage in an exponential decay problem.

2. A toddler has 430 Legos and loses his Legos at a weekly rate of 2.3%. Approximately how many Legos will the toddler have in five weeks? **about 383**

CHALLENGE: Tina and Amy leave Tina's house traveling in opposite directions on a straight road. Amy drives 20 mph faster than Tina bikes. After four hours, they are 240 miles apart. How fast does Amy drive? How fast does Tina drive? **Tina drives 20 mph, Amy drives 40 mph**

Name: \_\_\_\_\_ Obj : \_\_\_\_\_

Teacher: \_\_\_\_\_

Algebra Pd: \_\_\_\_\_

\_\_\_\_\_  
Day      Month      Year

**Do Now:**

**1. Blast from the Past:** Write the equation of the line that passes through  $(-2, 7)$  that is perpendicular to  $y = -x + 3$ .

**2. Simplify:** 
$$\frac{(-6x^2y^5z^{-8})^2}{(3x^{-3}y^{-5}z^{12})^3}$$

## Notes: Exponential Decay

### Formula:

$a =$  \_\_\_\_\_ amount

$b =$  \_\_\_\_\_ factor (must be between \_\_\_\_\_ and \_\_\_\_\_)

$x =$  # of \_\_\_\_\_ periods

### Two Main Types of \_\_\_\_\_ Decay:

1. \_\_\_\_\_:  $b$  is ALWAYS \_\_\_\_\_

2. \_\_\_\_\_:  $b =$  \_\_\_\_\_ - \_\_\_\_\_ Percentage.

Then change to a \_\_\_\_\_!

### Examples:

**Ex 1:** The half-life of carbon-14 is 5,700 years. If there are 400 atoms of carbon in a fossil today, how many atoms will be present in 39,900 years? Be sure to write the general exponential decay formula and show all substitution.

**Ex 2:** The thickness of the ice in Arctic regions is causing the population of polar bears to decrease at an annual rate of 4.2%. If there are 22,193 polar bears currently in the wild today, approximately how many polar bears will be in the wild in 2024? Round to the nearest polar bear.

Be sure to write the general exponential decay formula and show all substitution.

Exit Slip:

1. Explain how to find  $b$  if given a percentage in an exponential decay problem.
2. A toddler has 430 Legos and loses his Legos at a weekly rate of 2.3%. Approximately how many Legos will the toddler have in five weeks?

CHALLENGE: Tina and Amy leave Tina's house traveling in opposite directions on a straight road. Amy drives 20 mph faster than Tina bikes. After four hours, they are 240 miles apart. How fast does Amy drive? How fast does Tina drive?